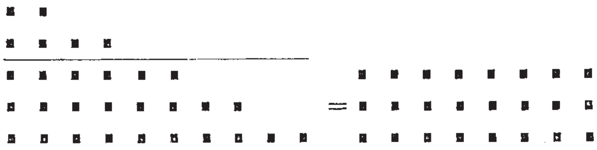
very similar to that of a table of triangular numbers, the only difference being that the added numbers 1, 2, 3, ... are each twice repeated. We may also regard the tabulated quarter squares as defined by this rule: The quarter square of n is equal, if n be even, to the sum of all the uneven numbers less than n, and, if n be uneven, to the sum of all the even numbers less than n. For evidently the series $1 + 3 + 5 + \ldots + (2n - 1) = n^2$, and the series $2 + 4 + 6 + \ldots + 2n = n^2 + n$.

By means of this definition of a quarter square we may exhibit the method of quarter squares diagrammatically as follows.

Taking as examples the products 8×3 and 7×4, we have

$$\text{qsq } 11 - \text{qsq } 5 = 8 \times 3,$$

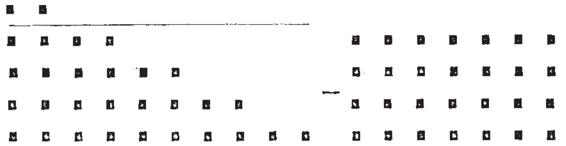
which may be represented by—



and

$$\text{qsq } 11 - \text{qsq } 3 = 7 \times 4,$$

which may be represented by—



The number of points in the extreme left-hand column of the difference of the quarter squares is always equal to the smaller of the numbers to be multiplied. If this number is uneven, there will be one middle line containing a number of points equal to the greater of the two numbers; the points in excess of this number are to be transferred from the line below the middle one to the line next above it, the excess from two lines below is to be transferred to make up the deficiency two lines above, and so on. If the smaller number is even, as in the second diagram, there are two middle lines differing from each other by two points; one point from the lower of these lines is to be transferred to the upper, three points from the line below the lower middle line to the line above the upper middle line, and so on.

It will be noticed that the tabulated quarter squares are, as it were, a species of triangular number in which the succeeding lines of points differ by two, instead of by one, as in ordinary triangular numbers (*i.e.* viewing the matter arithmetically, the quarter squares are derived alternately from the series $1 + 3 + 5 + \ldots$ and $2 + 4 + 6 + \ldots$, and the triangular numbers from the series $1 + 2 + 3 + \ldots$). It is the fact of the lines differing by two which enables us in all cases to adjust the points in the difference of two quarter squares so as to form a rectangle in the manner indicated above.

J. W. L. GLAISHER.

NOTES.

THE American Philosophical Society at Philadelphia is about to celebrate the centennial anniversary of the first occupation of its present hall. The celebration will be held on November 21. The Hon. Frederick Fraley, the President of the Society, will deliver an address in the afternoon of that day, and in the evening a banquet will be given at the Bellevue. The Society was founded in 1743 "for promoting useful knowledge."

ON November 16, the Naturwissenschaftlicher Verein of Bremen will celebrate the twenty-fifth anniversary of its foundation by an evening gathering and a banquet.

THE International Medical Congress will meet next year in Berlin, from August 4 to 10. Inquiries by intending visitors should be addressed to the General Secretary, Dr. Lassar, Karl Strasse, Berlin. The Congress will be divided into eighteen Sections, and the official languages will be German, English, and French.

THE Congress of the International Geodesic Association was opened in Paris, at the Foreign Office, on October 3. M. Spuller welcomed the delegates, who represented Austria, Belgium, Denmark, Spain, France, Greece, Hamburg, Hesse-Darmstadt, Italy, Holland, Prussia, Roumania, Servia, and Switzerland. M. Faye presided.

THE Ethnographic Congress, which held meetings of its various Sections every day last week in Paris, brought its proceedings to a close on Monday afternoon in one of the large halls of the College of France. It was decided that the Congress should hold its next meeting at Bucharest in the autumn of 1890.

THE next annual meeting of the Mineralogical Society will be held in the apartments of the Geological Society, Burlington House, London, on Tuesday, November 5, at 8 p.m.

THE Committee of the Sunday Lecture Society have decided that twenty-one lectures shall be given, during the winter, in St. George's Hall, Langham Place, on Sunday afternoons at 4 p.m., as in former years. The first lecture, on "The Origin and Uses of the Colours of Animals," with oxy-hydrogen lantern illustrations, will be delivered by Dr. Alfred Russel Wallace on October 20. This will be followed by lectures by Mr. John M. Robertson, Mr. Arthur Nicols, Mr. Chas. Cassal, Dr. Andrew Wilson, Prof. Percy Frankland, and Sir R. S. Ball.

ON Monday afternoon, about a quarter to 2 o'clock, a shock of earthquake was felt in Cornwall. It was accompanied by a loud underground noise like thunder, and was felt distinctly at Doubleborough, Boscastle, and Camelford. The earthquake is said to have been severe enough to shake houses, but no harm was done either to person or property.

THE death is announced from Georgetown, British Guiana, of Mr. E. E. H. Francis, Professor of Chemistry in Queen's College, Georgetown, and Analytical Chemist to the Government, at the early age of thirty-nine. Mr. Francis entered the service of British Guiana in 1875, having formerly been Professor of Chemistry and official analytical chemist in Trinidad. The two posts now vacant in Georgetown are said to be worth more than £700 per annum. Mr. Francis was a member of various learned Societies in this country.

AT the recent meeting of the Iron and Steel Institute, Mr. Frederick Siemens made some remarks during the discussion of Sir Lowthian Bell's paper on gaseous fuel, of which we gave an abstract last week. We draw attention to these remarks on account of the important influence Mr. Siemens's experiments and inventions have had on the application of gas for the heating of furnaces. Mr. Samson Fox had stated that he did not propose to use water gas alone for furnace purposes, but mixed with producer gas or other carburetted gas. Mr. Siemens said that a gas would thus be produced similar to that formed in the Siemens gas producer, which he had applied for a considerable time to furnace purposes. He had lately been experimenting with various gases for furnace use, and had come to the conclusion to divide gases generally into two classes, luminous and non-luminous. The latter, the class to which water gas belonged, could be advantageously used for heating by contact; as, for instance, in incandescent gas-lamps, for heating up refractory material to the temperature of incandescence, as the flame struck upon the material which had to give the light. But it would never do to heat high-temperature furnaces with a non-luminous gas, because it radiated very little light or heat, and, as he had proved some years ago, large furnaces must be heated by radiation to work economically and efficiently. Although it was proposed to mix water gas and producer gas, he thought that this would not be very easily effected, the one being supplied at a pressure, and the other without pressure. He had no doubt, however, that, if so mixed, they could be advantageously employed.

THE Report of the Manchester Technical School, presented at the annual meeting of the life members last week, is a very satisfactory document, and as a record of the year's work it is highly encouraging to all who are interested in the extension of technical instruction. The number of students has increased during the year from 2371 to 3328, and the amount paid in students' fees from £2970 to £3711, and the financial position is otherwise hopeful. The details of the work carried on in the school and in the recently-established spinning and weaving department, afford abundant evidence that the Council take a very comprehensive view of the sphere of technical education. The opening of this new department was the most important extension made during last year, and though at present the number of day students enrolled is small, there can be no doubt that, as the advantages it offers become better known, it will be more and more resorted to by those who wish to gain practical instruction in the chief textile industries in combination with the study of the scientific laws which regulate them. A considerable number of students are already attending the evening classes in the department. The Report refers to the proposal to establish a technical school in connection with the Whitworth Institute, and the prospects are considered promising by the Council. The negotiations between the Council and the Governors of the new institution will probably result in the foundation of a technical college on the scale, and with all the appliances, of the best schools of the kind in Germany and Switzerland. The growth of the school during the past six years is well shown in the following short table:—

Year ending July 31.	Individual students.	Tickets issued.	Fees.		
			£	s.	d.
1884	1429	2046	1259	12	5
1885	1995	2783	2010	10	5
1886	2299	3091	2241	11	8
1887	2529	3406	2931	10	4
1888	2871	3918	2970	1	8
1889	3328	4383	3711	15	0

THE grotto lately discovered near the caves of Adelsberg was said to be superior to these famous caverns. According to the Burgomaster of Adelsberg, who has written on the subject to the Vienna Correspondent of the *Times*, this is a mistake. The new grotto, he says, is very far from equalling the Adelsberg caves. It is a little more than a kilometre in length, and is believed to be a continuation of the Adelsberg caves. Its enentrance is half an hour's walk from the latter, between the villages of Gressotak and Zagon. It is rich in stalactites, but most of these have the appearance of being covered with white chalk.

THE Boston Society of Natural History is at present much interested in a scheme for the establishment of natural history gardens in that city, and it has authorized its Council to proceed with the work as soon as the sum of 200,000 dollars shall have been raised for the purpose. Mr. A. Hyatt, Curator of the Society's Museum, is sanguine enough to write, in his latest Annual Report, that "it is perfectly feasible to establish a series of natural history gardens which shall co-operate with the Museum and other public work of the Society, and to form, perhaps, the most effective apparatus for public culture in natural history that has ever been planned before for any city in the world."

LAST week we noticed (p. 549) the work done, under the supervision of Prof. Giglioli, at the stations established in Italy for ornithological observations. Similar stations were created in Saxony, in accordance with the decisions of the Ornithological Congress held at Vienna in 1884, and we have now received the fourth annual Report relating to the results achieved by the observers. The Report, which is accompanied by a map, is by Dr. A. B. Meyer and Dr. F. Helm, and presents a great mass of information, clearly arranged. The first Report, issued in 1885, contained the facts noted in Saxony by 43 observers, at 35 stations, regarding 180 species of birds. In the present Report there is a record of what 122 observers at 111 stations have to tell about 213 species of birds.

A FULL report of the Apple and Pear Conference held at Chiswick from October 16–20, 1888, is presented in the tenth volume to the Journal of the Royal Horticultural Society. The report opens with the address delivered by the President, Sir Trevor Lawrence, after which come the following papers: apples for profit, by Mr. GeorgeBunyard; fruit culture for profit in the open air, by Mr. W. Paul; dessert pears, by Mr. W. Wildsmith; on pruning, by Mr. Shirley Hibberd; canker in fruit trees, by Mr. Edmund Tonks; canker, its cause and cure, by Mr. James Douglas; enemies of the apple and pear, by Mr. J. Fraser; apples for Sussex, by Mr. J. Cheal; orchards in the West Midlands, by Mr. W. Coleman; apples and pears for Scotland, by Mr. Malcolm Dunn; cultivation in Jersey, by Mr. C. B. Saunders; production and distribution, by Mr. F. J. Baillie; compensation for orchard planting, by Mr. W. F. Bear; the railway difficulty, by Mr. D. Tallerman. The volume includes statistical and other information, compiled by Mr. A. F. Barron, as to the cultivation of apples in Great Britain and Ireland; and a descriptive catalogue, also by Mr. Barron, of apples exhibited in 1883 and 1888.

A SECOND edition of Prof. Lloyd Morgan's "Animal Biology" (Rivingtons) has been issued. The author has revised the text, substituted in several cases improved woodcuts, and added a brief classification of the types, and a glossary.

THE Royal Geographical Society has issued the sixth edition of the well-known "Hints to Travellers," edited for the Society by Mr. Douglas W. Freshfield and Captain W. J. L. Wharton, R.N. The work has been revised and enlarged.

M. A. VAYSSIÈRE has just completed the publication of his "Atlas d'Anatomie comparée des Invertébrés," in 60 quarto plates. This atlas, accompanied by concise and clear explanations, has been received with much favour in the zoological laboratories.

M. R. BLONDEL has published a pamphlet of 150 pages, with plates, on the odorous properties of the rose, and the methods used in industry for the extraction of its perfume.

MR. WILLIAM JORDAN has issued a pamphlet entitled "Instructions to Inventors as to obtaining Letters Patent and registering Trade Marks and Designs." Reference is made to the latest patent laws of Great Britain, our colonies, and foreign countries.

MR. R. H. PORTER has sent us his October catalogue of new and secondhand books. It includes many works of scientific interest.

PROF. G. POUCHET, Director of the Laboratory of Concarneau, has published, in a large quarto volume of eighty-one pages, with plates, an account of experiments made by him under the auspices of the Municipal Council of Paris, on the currents of the North Atlantic. The work deals more particularly with the Gulf Stream, and with the details of the experiments made on board the *Hirondelle* with the assistance of the Prince of Monaco, but also takes into consideration the results of investigators from the earliest times. The experiments refute the idea that the French coast is warmed by the Gulf Stream; M. Pouchet states that they show clearly that, at least in summer, no surface-current reaches France from the south-west, but that, on the contrary, there is a current from the west and north-west.

THE following details about the Tomsk University have been published. The buildings constitute the finest edifice in the town, and are situated in the middle of a magnificent park. When the staff is complete there will be twenty-five Chairs—thirteen ordinary, eleven extraordinary, and one for orthodox theology. There will also be librarians, teachers of music, and surgeons and assistant-surgeons. There are already seventy-two students, who pay about 12 or 13 roubles a month for lodging, books, and attendance, and it is expected that this number will be largely increased before the end of the year.

THE Pilot Chart of the North Atlantic Ocean for the month of September shows that the most important storm during the month of August was one first reported about San Domingo on the 19th, whence it moved north-westward over the Bahamas and afterwards recurved and followed the course of the Gulf Stream. During the first half of the month the pressure along the Atlantic States was persistently high, and the tracks of all storms from the continent lay well to the northward of this area of high barometer, moving mostly beyond the region of observation. No storm can be traced all the way from the American continent to the British Isles, although several originated in mid-ocean and moved in an east-north-east direction. A severe tornado was reported off Cienfuegos, Cuba, on August 4. Ice was reported in great quantities about the Straits of Belle Isle, but very little off the Grand Banks.

METEOROLOGICAL science will be much enriched by the recent contributions of the Danish observers in Greenland during 1882–83 ("Expédition Danoise," vol. ii., part 2, Copenhagen, 1889). The principal station was at Godthaab, on the west coast of Greenland, in latitude about 64°, where the observations were made under the direction of M. Adam Paulsen. A large series of observations of temperature was made and the results are given in tables, as well as represented by curves. The temperature was taken every hour during twelve months, and the mean temperatures at each hour for each month are given in the tables. As might be expected, the greatest variation occurs in August—namely, from + 3°·5 C. at 3 a.m. to + 7°·2 at 2 p.m. The minimum variation is in February, from − 15°·4 to − 15°·7. During the summer months the maximum occurs about 1 p.m., and in winter about 2 p.m. Similar results are recorded for the stations at Reykjavik, in lat. 64° and Stykkisholm, in lat. 65°. The maximum monthly mean temperature occurs in July, and the minimum in February. Observations were also made of the direction, force, and velocity of the wind, form and direction of clouds, temperature of the soil, &c., full details of which are given in the report. An appendix contains the results of various meteorological observations in the Kara Sea in 1882–83, and at Nanortalik and D'Angmagsalik. Observations of auroræ at the two latter stations and at Godthaab also form part of the appendix. It is greatly to be regretted that the spectroscope was not employed in the auroral observations.

THE additions to the Zoological Society's Gardens during the past week include a Mealy Amazon (*Chrysotis farinosa*) from South America, presented by the Hon. and Rev. F. G. Dutton; two Cape Crowned Cranes (*Balearica chrysopelargus*) from South Africa, presented by the Hon. Mrs. Barker; seven Common Slowworms (*Anguis fragilis*), British, presented by Miss Alice Leonora Selly; a Common Chameleon (*Chamæleon vulgaris*) from North Africa, presented by Mr. J. Watkins; a Long-nosed Crocodile (*Crocodilus cataphractus*) from West Africa, presented by Mr. John R. Holmes; a Royal Python (*Python regius*) from West Africa, deposited; four Common Rheas (*Rhea americana*) from Holland, purchased.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1889 *OCTOBER* 13–19.

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on October 13

Sun rises, 6h. 23m.; souths, 11h. 46m. 11·5s.; daily decrease of southing, 14·0s.; sets, 17h. 10m.: right asc. on meridian, 13h. 15·1m.; decl. 7° 57′ S. Sidereal Time at Sunset, 18h. 40m.

Moon (at Last Quarter October 17, 1h.) rises, 19h. 7m.*; souths, 2h. 57m.; sets, 11h. 0m.: right asc. on meridian, 4h. 24·4m.; decl. 19° 11′ N.

Planet.	Rises.		Souths.		Sets.		Right asc. and declination on meridian.			
	h.	m.	h.	m.	h.	m.	h.	m.	°	′
Mercury..	7	2	12	4	17	6	13	32·8	12	4 S.
Venus.....	3	25	9	56	16	27	11	24·3	5	19 N.
Mars......	2	45	9	29	16	13	10	57·6	8	5 N.
Jupiter....	12	47	16	39	20	31	18	9·0	23	30 S.
Saturn....	1	36	8	44	15	52	10	12·6	12	27 N.
Uranus...	6	32	11	54	17	16	13	23·1	8	8 S.
Neptune..	18	54*	2	43	10	32	4	10·3	19	21 N.

* Indicates that the rising is that of the preceding evening.

Oct.	h.	
16	0	Mercury in inferior conjunction with the Sun.
16	13	Venus at least distance from the Sun.

Variable Stars.

Star.	R.A.		Decl.				
	h.	m.	°	′		h.	m.
U Cephei	0	52·5	81	17 N.	Oct. 15,	2	45 *m*
λ Tauri	3	54·5	12	11 N.	,, 16,	21	36 *m*
ζ Geminorum	6	57·5	20	44 N.	,, 13,	23	0 *M*
					,, 19,	2	0 *m*
U Coronæ	15	13·7	32	3 N.	,, 17,	23	5 *m*
β Lyræ	18	46·0	33	14 N.	,, 16,	22	30 *M*
U Aquilæ	19	23·4	7	16 S.	,, 19,	19	0 *M*
η Aquilæ	19	46·8	0	43 N.	,, 13,	22	0 *M*
T Vulpeculæ	20	46·8	27	1 N.	,, 19,	19	0 *M*
δ Cephei	22	25·1	57	51 N.	,, 16,	21	0 *m*
S Aquarii	22	51·2	20	56 S.	,, 14,		*M*

M signifies maximum: *m* minimum.

Meteor-Showers.

	R.A.	Decl.	
	°	°	
Near γ Andromedæ	26	43 N.	Slow; faint.
,, ξ Ceti	31	9 N.	Slow; trained.
,, ν Arietis	41	20 N.	Swift.
,, κ Cephei	307	77 N.	Slow; faint.

THE LIFE-WORK OF A CHEMIST.[1]

IN asking myself what subject I could bring before you on the present occasion, I thought I could not do better than point out by one example what a chemist may do for mankind. And in choosing this theme for my discourse I found myself in no want of material, for amongst the various aspects of scientific activity there is surely none which, whether in its most recondite forms or in those most easily understood, have done more to benefit humanity than those which have their origin in my own special study of chemistry. I desired to show what one chemist may accomplish, a man devoted heart and soul to the investigation of Nature, a type of the ideal man of science—whose example

---

[1] An Address delivered to the members of the Birmingham and Midland Institute, in the Town Hall, Birmingham, on October 7, 1889, by Sir Henry E. Roscoe, M.P., D.C.L., LL.D., F.R.S., President.